



Einladung zur Fortsetzung des Habilitationsverfahrens von

Herrn Dr.-Ing. Markus Becherer

Akademischer Vortrag im Rahmen der Schlussbewertung

(Dauer: 45 Min., Vortragssprache: Englisch)

am Freitag, den 11. November 2016, 10.00 Uhr (s. t.)

im Nordgelände der TUM, Gebäude N1, 1. Stock, Raum N1135

„Monolithic 3D Integration of Nanomagnetic Logic“

Abstract:

As CMOS scaling becomes more and more challenging, there is strong impetus for beyond CMOS device research in order to add new functionality to ICs. A promising technology for digital computation with non-volatile ferromagnetic computing states is the so-called perpendicular Nanomagnetic Logic (pNML). Due to logic operation via magnetic field-coupling, it combines 3D device-level integration with a planar 2D fabrication process.

After recapitulating the 2D implementation of NML, the path to monolithically 3D integrated systems will be discussed. Rather than CMOS substitution, additional functionality is added by a co-processor architecture as a prospective back-end-of-line (BEOL) process. For modelling of Boolean gates and circuits, a three step approach is found to be well suited. First, micro-magnetic finite element simulations provide insight in the physics of magnetization reversal dynamics and domain-wall propagation of single pNML devices. Second, together with magneto-optically characterized test-structures, switching distributions of magnets are extracted and simplified behavioural models are formulated. Third, the parameterized compact models form the basis of Verilog-A simulations, utilizing the well-known strength of abstraction in system level simulation.

It is found, that the unconventional computation in the ferromagnetic domain can lead to highly dense computing structures without leakage currents, attojoule energy dissipation per bit operation and data-throughputs comparable to state-of-the-art high-performance CMOS CPUs.

Der Vortrag ist **hochschulöffentlich**.

Dekan Prof. Dr. Paolo Lugli

München, den 21. Oktober 2016

Verteiler:

Fachmentorat, Präsident der TUM, Dekane der TUM, Fakultätsrat, Professorenkollegium